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THE MUSHROOM GROWERS'
ASSOCIATION

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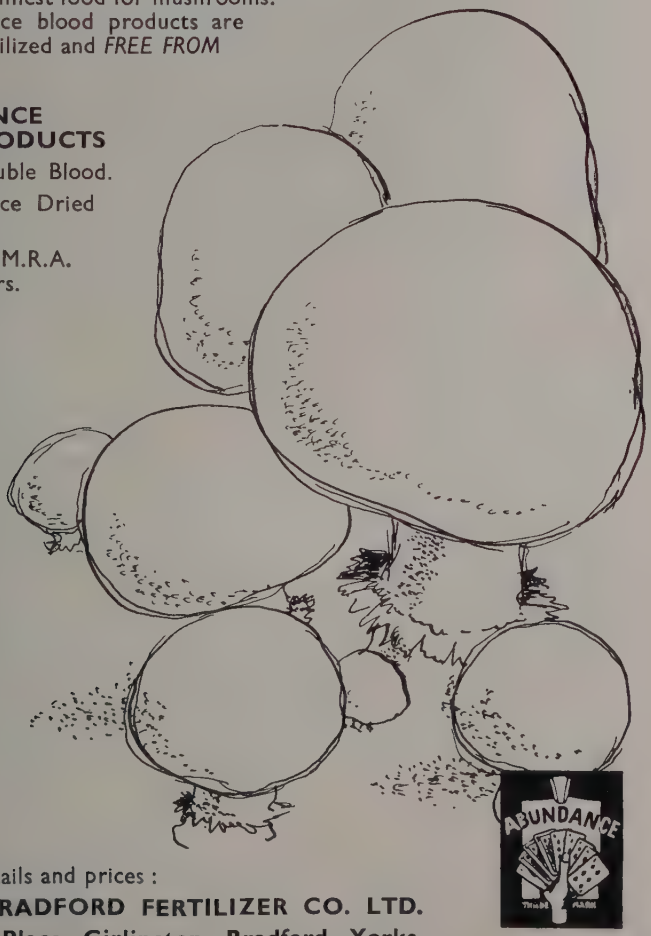

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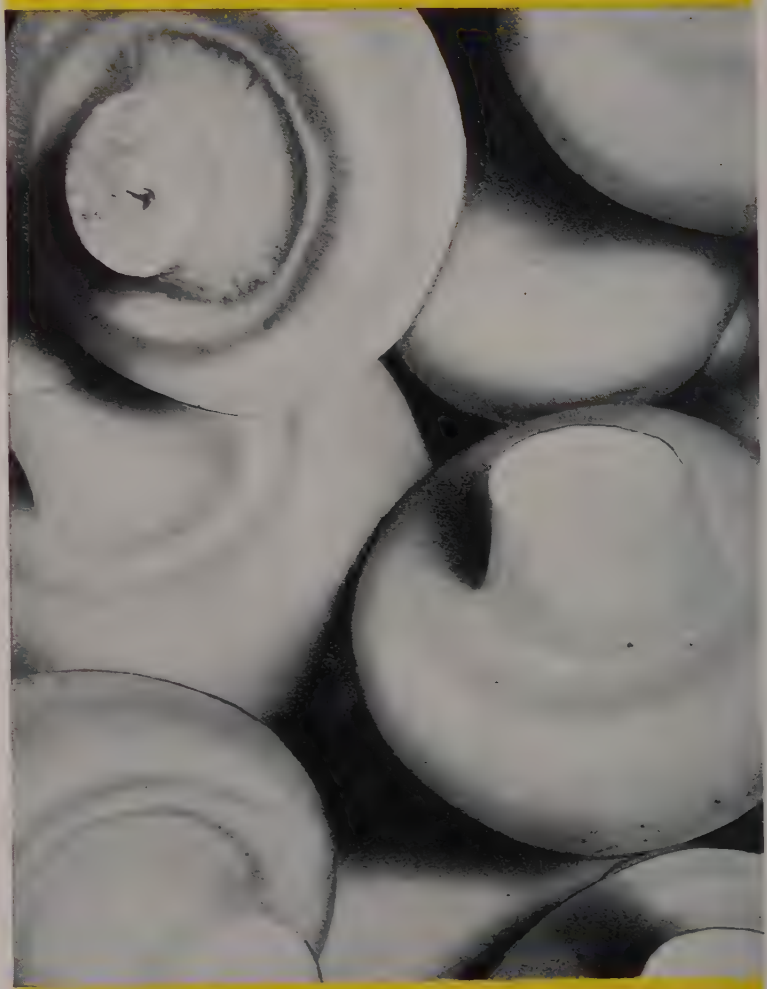

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The
MGA BULLETIN
FEBRUARY · 1954
NUMBER 50

EDITORIAL

PUBLICITY

Publicity—that is the cry which is being raised in horticultural circles throughout the country and, since any satisfactory publicity campaign requires money, ways and means of raising money are being eagerly explored.

Let us, in the Mushroom Industry, face it. We badly need publicity for successful publicity means increased demand and price stability. True, we have enjoyed relative prosperity in fair measure for some years, but it is equally true that there is every indication that prices will continue their downward trend unless something is done without delay. Increased costs are a certainty.

There are two ways of combatting this situation. First, by increased efficiency in growing with a consequent reduction in costs and, secondly, by a publicity campaign designed to increase demand for, of a certainty, there is a tremendous field in this country alone which has as yet been untouched by cultivated mushrooms.

Efficiency is a matter for the individual grower, but publicity is the pigeon of the MGA, supported by its members. The latter responsibility is one which the Association willingly accepts.

Unfortunately the proposed Spawn Levy—1d. on each carton —which was estimated to produce over £3,000 per year for publicity, was not acceptable by the Spawn Makers as a whole. Some were in favour but other and louder voices prevailed and so, for the time being, the scheme is held in abeyance, excellent though it was and involving a contribution of only about 14 - for every £1,000 worth of mushrooms produced !

Now comes an alternative out of the blue—an offer by Messrs. J. Collingridge Ltd., the Covent Garden salesmen, not only to deduct a farthing per chip of mushrooms consigned to them by members, but also to add an additional farthing themselves as their contribution to publicity. This is a scheme approved by your Publicity Committee and in which, it is hoped, all growers and salesmen will take part. If all members agreed, what a splendid example the MGA would set to other branches of the horticultural industry.

Shortly you will receive a communication asking for your support and the name of your salesman. When it arrives, do please fill it in. It is so vitally important.

WINSTON ALDERTON

MIDDLEBROOK'S
50th DIARY

Dec. 10. The time has arrived for me to record some of the verbal warfare I am waging with my critic. He is a quiet, moderate, temperate little man, quite inoffensive. But with one great failing. He is an MGA fanatic, intolerant of weakness, apathy and disloyalty to it, and has dedicated his whole life to improving the power, influence and usefulness of the Association throughout the land. To this end he attacks me all too frequently and I fear increasingly successfully.

Critic: There's no need to sneer, S.M. You, too, are intolerant; not of weakness and stupidity, but of authority, up-to-dateness, the modern and futuristic outlook, editorial wisdom, scientific infallibility, spawnmakers' bluster, and tray growers' invulnerability. You are becoming too audacious, too cheeky, too self-opinionated. You pretend to know all, but know nothing. It's time this nonsense ceased.

S.M.: You go too far. What do you want me to do?

Critic: First of all apologise decently to all those people you have offended during your eight years of writing in this Bulletin.

S.M.: I find that hard to do, because most of them are wrong anyway. I may not be right, but they're definitely wrong. You don't agree? Very well, here goes! SPAWNMAKERS: I'm sorry if I've ever hurt you, or suggested that you don't all make the best spawn, or ever inferred that all your spawns won't produce 4 lb. per sq. ft. at all times in all conditions. I have been wrong in thinking there could ever be a phorid egg in a spawn carton or a penicillin mould on a grain. EXPERTS: I apologise for ever doubting your knowledge, despite the alleged fact that the expert's ultimate achievement is to know everything about nothing. If I've ever taken your advice and regretted it I'm sorry I've mentioned the fact. I've been at fault, perhaps, in submitting that experts are sometimes wrong. PUNDITS and LEARNED DOCTORS: Most of us get on fairly well in spite of you. You yourselves are enigmas and your proclamations are equally puzzling. I apologise for ever taking any accidentally useful but characteristically non-committal advice you have given, for believing that you gave me it, and for not believing that you didn't give it.

Critic: That is nonsense, and you know it. Carry on.

S.M.: Isn't most *advice* nonsense? TEXTBOOK WRITERS: I'm sorry if I ever hinted that you are in a class by yourselves or that there is, in practice, no possible connection between your work and ours. In fairness to you I must admit that I don't clutter up my mind by reading textbooks and am therefore not in a good position to ask " Why, oh why, do you write the things?" Now, Critic, perhaps you'll let me get on with the Diary.

Critic: Not so. You've forgotten the Editor.

S.M.: Must I? You're very hard. EDITOR: O Great and Wonderful One, I apologise for ever arguing that your word should not be final, for ever disagreeing with you, for never writing the many articles I promised on watering, composting, casing, picking, packing, grading, filing systems, recording systems, My Way of Growing, How to build without bricks, How to avoid the Canteen, How to grow on Shelves, etc.

Critic: You would have to get that one in. You really must stop baiting tray growers; now apologise to *them*, or one day they will turn.

S.M.: This is the end. I can't stoop so low. But which way will they turn? Tell Mr. Atkins I've made my bed but I don't lie about it. I have stuck to the truth; tray growers are . . . . . .

Critic: Stop! Choose your words. Be kind to tray men.

S.M.: The words *were* chosen well chosen. But, to obey. TRAY GROWERS: I apologise for thinking that you may have gone off the rails (or rollers) and that your method is as mythically marvellous as it is mad. I regret ever having hinted that you can't or won't produce figures to prove your superiority over shelves. I should never have taunted or twitted you. I shall never forgive myself for producing facts and figures in support of my contentions and for hoping and believing that you wouldn't listen and learn.

Critic: You see. You can be extremely objectionable, irrational, irascible, thoughtless and insulting. You have made yourself a lot of enemies.

S.M.: On the contrary, miserable Critic, I count among my friends and acquaintances a large number of tray men. Indeed my fan, a tray man, wrote in 1952 "I hold your opinion in high esteem." He is still a tray man! Abominable Critic, I can say I have made very many friends in an industry which has produced not a single uninteresting personality. Now allow me to get on with the Diary notes.

Critic: Nothing of the sort. There is just one more thing.

S.M.: What's that? What do you want me to do now?

Critic: Just this. GET OUT!

S.M.: You mean . . . . . you don't mean . . . . . Get out? Stop writing? The Diary? You can't do that to me. I'll talk to the Editor.

Critic: That'll do no good. He's with me. They're all with me. Listen. Swashbuckler. This is your 50th Diary and you've been at it too long. You're immensely stale, you're not funny any longer, you're unreasonably critical, you're hiding other people's light under your bushel and, in short, you've had your day. Make way for someone else with brighter and more modern ideas than yours. GO!

S.M.: Those are strong words, Critic. I ignore them. To proceed.

Dec. 18. We are getting more and more *Mycogone* with peat casings, yet peat salesmen solemnly declare that all peat because of its acidity is innocent of all disease and contamination. Nonsense. What if unprecedented demand is driving the diggers too near the surface? And is there any proof that "bubble" spores cannot be in surface peat? It's significant that we had no trouble when we first started with peat. Where has *Mycogone* come from? Anyway I'm not alone in this complaint; some peat users are discovering for the first time what *Mycogone* looks like. 'Tis better to learn late than never to learn at all!

Dec. 23. I have little doubt that mushroom growers are in for a bad time. We have practically reached the over-production stage and the only solution is to raise the ½ lb. per head per year consumption. Publicity. We have a very energetic Publicity Committee—all power to them—but I warn them that I for one will contribute nothing if payments to any fund are to be expected on a voluntary basis. I'm not again falling into the "Research" trap, where a quarter of the industry created something for the good of all while the remaining three-quarters sat back complacently, expecting and taking all, but giving nothing.

Jan. 2. If you believe all forecasting to be inevitably fictitious, you will be cheered by my price predictions for 1954. *(a)* A downward trend to the end of July. *(b)* A July "low" of about 2 3d. nett. *(c)* A variation during the year between 2 3d. nett (July) and 3 11d. nett (October).

(*d*) Average for the year around 2/11d. to 3/1d. nett. I'm not betting on it. Note the figures are nett; that is after all the varying charges for agents' commissions, porterage, tolls, 'phone calls, telegrams, etc., are deducted. They are based on the trend of the last three years. 1954 may be better or worse than the trend, so it all gets you nowhere anyway. Forget it.

Critic: Typical example of your fatuity. Why mention it then say " forget it "? This sort of thing can't go on.

Jan. 4. It was a psychological error on someone's part to have the steps which graphically illustrate McBulloch's article in the January Bulletin running *downwards*. We know the industry is sinking fast and taking us with it, but this is no way to talk to newcomers—or perhaps it is! If the first steps are downwards it will discourage many, but I always understood that beginners' luck ran upwards in this game.

Jan. 6. Since I was recently discovered by a fast moving police patrol exceeding the speed limit in a restricted area (open double carriageway), and duly fined and " endorsed," I have been amazed at the number of people similarly victimized. I was and still am rationally annoyed that I should be " branded " as a dangerous driver (that's the inference if not the legal fact) for doing what every other motorist in the country does many times a day. Neither driving ability nor danger were in question, said the patrols, but I had merely broken a law! One soon finds, however, that one is up against a brick wall when one suggests that a law made around 1931 is quite out of date when applied to the modern motor car with its improved braking and stability, not to mention driving schools, etc. The nett result of this victimisation is that more and more motorists are giving their attention to the speedometer needle and the hidden police patrol instead of to the hazards of the road. (Keeping the needle down to 30 in a modern car is a full-time job in itself.) I've not been quiet about it; I have talked much and with many people and now I am not surprised to find some mushroom growers in the army of victims. Hence the following note on a Christmas card received from the London area: *To Stanley Middlebrook, Mushroom Grower and President of the " Over 30 Club," Greeting. Speed's the thing for 1954. I'm expecting my third endorsement any moment.* It's taking a long time to come round to the point . . . . . .

Critic: You're right. What has all this to do with mushroom growing? It's not helpful, it's not advice, it's not even a pertinent comment. It's a waste of Bulletin space.

S.M.: Sorry, Critic. But you see I know the sender of the card to be a Tray fanatic and can only assume that his reference to speed means that he's on the twin track to complete immobility . . . . . .

Editor: This persistent sniping at the Tray System must stop.

Jan. 9. Finally, and seriously. I have thoroughly enjoyed writing every item of these 50 Diary extracts and sincerely hope my successor, in whatever form his contributions take, finds the same satisfaction that has always been mine. I have found many friends and hope to keep them. I may have been able to help some and I have received much help. The above " Critic " is, of course, my better self, and no doubt the world will be the better for our passing.

Dr. LEON R. KNEEBONE *reports on*

SPAWN RESEARCH

at Pennsylvania State University

Those who are reasonably well acquainted with the mushroom industry in Europe and North America are aware that mushroom research has been continuous at Penn State for more than 25 years. Early contributions to our understanding of the morphogenesis of the mushroom and in the use of soy bean stover and straw in compost were made by I. Hein. This work was followed by the researches of W. S. Beach into the control of mushroom diseases and weed fungi. For most of the past 20 years, under the able direction of J. W. Sinden, such outstanding contributions have been made to mushroom culture as the development of grain spawn, synthetic composts, shorter methods of composting, and better control practices for some of the most damaging mushroom diseases.

One of the most recent investigations Dr. Sinden was pursuing prior to his departure from this institution in March of 1953 was concerned with the development and behaviour of strains of the commercial mushroom, especially the use of short wave-length radiations to induce mutations. Most of the procedures to be mentioned in the following brief presentation were prescribed by him.

Short wave-length radiations have long been used to produce mutations in higher plants and among certain micro-organisms. However, a perusal of the literature reveals that ultra-violet and gamma radiations have probably not been used to irradiate mushroom spores for the purpose of inducing progressive mutations which might improve quality or yield.

Preliminary results of our investigations indicate that worth-while mutations in the commercial mushroom may be obtained by exposure of the mushroom spores to ultra-violet radiation. Specifically, of more than 500 irradiated single colony isolates, at least five distinctive selections have been obtained. Two of these are colour mutants and three manifest high yielding qualities. One in particular is a physiologically vigorous, fast growing, and high yielding culture which has evidenced superiority in early commercial trials.

The preliminary results of exposure of mushroom spores to gamma and thermal neutron radiations from uranium have not been so encouraging. However, the longest exposure attempted thus far has been 48 hours at which exposure there was no decrease from the checks in the percentage of germination. It may be that the thick-walled, darkly pigmented, and naturally resistant spores of the mushroom will be affected by longer exposures which are being tried.

It is axiomatic that rigid controls must be set up for all variable factors which would tend to affect the evaluation of a strain or cultural

isolate. This we attempt to do in the selection of raw materials, in the composting, in the pasteurization, in the manner of spawning, in casing, and in the manipulation of the environmental factors immediately affecting production.

The usual procedure in these studies is as follows: —

For the investigations employing ultra-violet radiation the mushroom spores are aseptically collected, suspended in sterile distilled water, pipetted or atomized onto hard potato-dextrose-yeast agar plates, and irradiated from 20-40 minutes at a distance of six inches under a " Uviaire " germicidal lamp. It is also contemplated to use a mercury arc lamp as a source of ultra-violet radiations. With the technique employed, exposures of less than 20 minutes duration result in no reduction in the percentage of germination and no apparent mutagenic effects, while exposures longer than 40 minutes are lethal. Care is exercised to eliminate any clumping or shading of the spores to be irradiated.

Spores which survive these irradiation treatments are allowed to germinate and the resulting single colony cultures are transferred to P D Y agar slants. For the most part these are actually single spore cultures. Subsequently grain spawn is produced in duplicate from these cultures and they are spot-spawned in uniform trays of compost.

As the crop comes into production, comparisons are made between the irradiated cultures and their respective checks. Any departure from the normal is recorded and photographed and desirable selections are replicated six times in verifying trials to establish the stability of the changed character. Effort is made to select not only for morphological changes in the mushroom itself but also for increased rate of vegetative growth, earlier breaks, resistance or tolerance to unfavourable environmental factors, and increased yields.

For the investigations employing gamma and thermal neutron radiations the spores are aseptically collected and placed into sterile lucite vials having polyethylene caps. These plastics were selected because of their non-absorption of the gamma radiations and non-retention of radioactivity. These vials are sent to the Brookhaven National Laboratories, Upton, L.I., N.Y., where the spores are exposed for various times in the gamma and thermal neutron field of uranium. The vials are then returned to us and the procedures for germination, isolation, and production are followed as explained in the preceding paragraphs.

When a culture has evidenced a certain superiority in repeated trials at the experimental level it is tested at the commercial level by co-operating mushroom companies in the United States.

In conclusion, the practical value of this line of investigation is not realized unless the selections prove desirable to, and are adopted by, the industry. This has taken place to a moderate degree as a result of promising early experimentation.

FRED. C. ATKINS *summarises opinions on*

"SPENT" COMPOST

Dr. Edwards told us at Harrogate that some of the Experiment Stations had either started, or were about to start, cropping trials with spent mushroom compost, but that it might be several years before the results were published. In view of this delay, a summary of opinions already expressed might be useful. A leaflet, with certain amendments, could prove of value as propaganda for those members who wish to sell their compost.

Incidentally, *The Fruit Grower* (now *The Commercial Grower*) suggested on 3.11.49 that " possibly the periodic issue of a list of mushroom growers having spent compost for disposal is another job for the MGA to tackle."

Mr. P. B. Flegg, B.Sc., A.R.I.C., the research chemist at Yaxley, recently published the following useful analysis:

	N	P_2O_5	K_2O
	lb. per wet ton		
Farmyard manure	12	5	12
Spent horse-manure compost (excluding soil) ..	17.5	6	20
Spent horse-manure compost (including soil) ..	8·8	3	10
Spent MRA synthetic compost (excluding soil) ..	26·5	13	9
Spent MRA synthetic compost (including soil)	13·2	7·5	4·5

A particularly important statement on the value of this "by-product" is to be found on pages 57 and 58 of the 1950 edition of the Ministry of Agriculture's Bulletin 34:

Spent mushroom compost is of much higher manurial value per ton than either fresh or composted horse manure . . . . . The spent manure is higher in total nitrogen and organic matter and is considerably higher in ash, including the minerals potash and phosphorus: more organic matter is readily decomposable in the soil, and the nitrogen becomes available to plants more rapidly. At the same time the spent manure contains a high amount of lignin to augment the more permanent organic matter or humus in the soil and is therefore valuable in improving soil structure. In the U.S.A., spent compost is contracted for, dried, ground up, and marketed for use on golf greens, etc., and it is recommended for this purpose in the Journal of the Board of Greenkeeping Research 1930. There appears to be little risk of introducing weed seeds with spent compost, as these are almost certainly destroyed by heat in the compost heaps. The chances of introducing weed seeds are greater if the spent compost contains casing soil, though it is usual to use subsoil and in many instances the soil is pasteurized. In this country a certain amount of spent compost is dried and sold under a trade name for use on lawns and in gardens for manuring and mulching. The dried material is correspondingly richer than the moist. Owing

to lack of experimental work, the manurial value of spent compost to specific crops cannot be stated. When it is well run, spent compost has a pH of about 5·2 and it should therefore be a valuable source of organic nitrogen and humus to plants that prefer acid conditions in the soil but it might be harmful to other plants when the soil contains a low reserve of lime. Since casing soil may be included with the spent compost, the latter should be bought and used according to its analysis. It may be from two to three times as rich as ordinary well-rotted farmyard manure.

What do growers themselves think of it? Among the following opinions are several already published in *The Fruit Grower*.

It is wonderful for lightening soils and has an excellent humus-forming value—Mr. E. D. Sparkes, Littlehampton.

We have found it better than ordinary manure, easy for working, keeps the soil open, and improves humus content—Messrs. Knight, Chichester.

We have been using it as a substitute for dung since 1928, and have found it excellent for general vegetable work—Messrs. Church Farm Nurseries Ltd., Rustington.

We use it for potting, with good results—Messrs. W. Fromow, Chiswick.

It is marvellous material—especially for opening-up heavy soil and making the soil easy to work—Messrs. C. I. Spinks, Southwell.

It appears to be particularly useful for certain crops:

We use it extensively, we cover bulbs with it, use it on carnations, grow strawberries in nothing but mushroom compost—Mr. H. G. Boxall, Angmering.

We find it ideal used with strawberries and as a general top dressing and with tomatoes and asparagus—Mr. Raymond Thompson, Chichester.

We have found it especially useful for mulching strawberries, as it keeps down weeds and makes hoeing easy—Messrs. A. P. McIntyre, Lancing.

Our cucumbers are grown entirely in spent mushroom material and are giving excellent results—Messrs. C. J. Randall, Rockbeare.

In our glasshouses we mix it into the top soil for tomatoes and lettuce, and also use it on gladioli bulbs and, outdoors, for mulching raspberries—Messrs. C. I. Spinks, Southwell.

Strawberries will do well in mushroom compost—Mr. J. Watts, Sidlesham.

We have experimented in growing iris bulbs in spent compost and they were as good as any grown in Holland. We also recommend it for carnations, cauliflowers, ploughing-in and general market-garden crops—Mr. A. DeB. Hovell, Rustington.

Mushroom compost has produced excellent lettuce crops on my holding for many years—Mr. J. R. Ashton, Tarleton.

But there are difficulties which must be faced. Here are most of them, I hope:

Most Worthing growers stack their compost to weather for a year—Mr. H. G. Boxall, Angmering.

It has a tendency to be slightly acid, necessitating the addition of lime—Messrs. Church Farm Nurseries Ltd., Rustington.

It is no good for peas or lettuce—Messrs. A. P. McIntyre, Lancing.

Because it is dry we believe it should be well watered before being ploughed in—Mr. R. Thompson, Chichester.

Spent mushroom compost increases the attraction of the soil for bean-seed flies—Mrs. Mary Miles, Wye.

If the mushroom beds have been treated with BHC, use the compost for non-food crops, and certainly not for roots or potatoes—A correspondent in *The Nurseryman & Seedsman.*

When tried in a Dutch light structure severe symptoms of manganese deficiency in tomatoes followed; I cannot say whether this was caused by the compost, but we should be very careful before advocating mushroom compost for every purpose—Mr. J. R. Ashton, Tarleton.

If the casing soil is a heavy subsoil and is sold with the compost, there may be objections from growers who buy it to lighten their own soil—F.C. Atkins, Yaxley.

Some of these opinions may be contradictory and ill-founded, but they must be considered if we are to play fair. **Perhaps our lively new Executive would set up a Sub-Committee to draft a LEAFLET which would help us to dispose of our compost without opening the door to claims for misrepresentation?**

Mr. W. A. B. HARDING adds a footnote

Having had an Editorial Board Member's privilege of a preview of Mr. Atkins's notes, I am prompted to ask what more can be said from the present limited knowledge of its value without slipping into a stage of misrepresentation. For the time being the material can be recommended with assurance only and mainly for market gardeners and nurserymen; but cannot a less mis-leading title be evolved for the time when it is introduced to the unversed potential purchaser. The misnomer " spent " goes out of its way to create suspicions which are already numerous enough, although quite unjustified.

Among the soft fruits could be added the bush and cane crops (e.g.) currants. There is one recommendation only for raspberries, which do very well on a *heavy* mulch, often producing a second crop in the autumn and an ' out of season ' market return. But for propaganda among the prejudiced hop growers and arable farmers (I refer particularly to the Kentish Weald locality in which my ' plant ' is centred and where I have great difficulty in disposal), there is no conclusive evidence either way for recommending our " by-product." Consequently, I feel that some facts should be obtained for its use by ' hard ' fruit and hop growers, and by the purely agricultural holdings.

In this Wealden locality I have been confronted with the allegation that certain of the above crops experience an adverse effect, such as " Nettle-head " of hops, which really is of virus origin, although a soil factor has been shown to initiate this disease. This allegation I quite recently took up with the NAAS at Wye who confirmed that a soil factor can give trouble but they have no recorded experiment to show what mushroom compost will do to hops, and therefore as no experimental work has been carried out at any time they can only generalise in commenting on the use and value of the material, and refer the seller to Mr. Flegg's analysis.

In view of the strong requests from Members at both the 1952 and last General Meetings of the MGA I think that while awaiting the

inevitable slow progress of the experimental stations before official recommendations can come from such authorities, it is imperative for the MGA to devise an interim measure of propaganda to suit individual sellers and individual types of buyers to assist the ' specialist ' mushroom grower in disposing of his valuable by-product and potential part-income in the districts essentially agricultural where there is a firm prejudice against it. Obviously the high cost of transport is a limiting factor to the radius within which it could be economically marketed.

There have been instances of this compost being dried, bagged, and offered for as much as 15/- per cwt. bag carriage paid, so would it not be feasible for a few growers in each locality to get together for such processing?

An article distributed for publication in the gardening and trade journals of horticulture and agriculture might be a start; and in the meanwhile I support Mr. Atkins that the MGA, with a Leaflet in view, should appoint a sub-committee to draft propaganda in condensed form. This is another Publicity project, but the present lively team doubtless has its hands full at the moment, so perhaps some of those on the Executive Committee who are not already on sub-committees and who are affected most might lend a hand with this important problem.

DO YOU BENEFIT?

The continued representations made by the National Farmers' Union to the Ministry of Transport on the conditions attached to Farmers' Goods Vehicles (F) Licence for motor vehicles have at last borne fruit and concessions have now been granted and became operative as from 1st January, 1954.

Hitherto, a strict interpretation of the conditions attached to such a licence prevented the vehicle from being used for private purposes, the official view being that a vehicle also used for private purposes became liable to the higher licensing rate.

As from 1st January, a " farmer's goods vehicle " (used for the conveyance of produce of or articles required for the use on agricultural land) may be used for private purposes also. If the " F " licence rate is higher than the rate for " private purposes " then the " F " rate has to be paid, but if the " goods vehicle " licence is less than the " private purposes " rate, then the latter rate is paid.

As an example, in the past a Land Rover, under the " farmer's goods " licence, has commanded a licence payment of £11 10s. 0d. per annum. Used privately as well as for goods transport, the licence duty has been £17 10s. 0d. per year plus an added fee of 25/- for five years for a " C " carriers licence. From now on this vehicle can be classified as " private and goods (farmers)" and licence duty payable for the year is £12 10s. 0d.

All praise therefore to the N.F.U., for righting yet another wrong!

W.R.A.

THE FRED. ATKINS ALPHABET—B

Bacteria. Minute organisms which we bless when they perform for us complex operations in the compost stack, but curse when, for reasons unknown to us, they carry out similar subversive activities on growing mushrooms.

Bacterial Diseases. These sources of widespread losses are not by any means confined to "pit" and "spot." Spot, though more frequently seen, is probably more readily controlled by adequate ventilation, but the cause of Pit remains conjectural and its exclusion difficult. Stem Rot and Weeping Disease provide such sorry sights that the most hardened growers could be excused from breaking down and sobbing.

Badhamia untricularis. This bright-yellow slime mould, reported recently by F. C. Wood, spreads rapidly over damp beds but can be controlled by holding off water.

Bedboards. It was suggested to me during the war, when timber was particularly scarce, that permanent concrete shelving would be preferable. This advice was given by a civil servant with no knowledge of mushrooms and whose objective in life seemed to be the refusal of permits. My own opinion is that the one advantage of concrete is more than offset by the several disadvantages. Bedboards properly cared for have been known to last more than 15 years, although, of course, if they are neglected they can easily give rise to site contamination (grower language for "the cumulative effects of inadequate hygiene.")

Beds. Too many growers hold the view that, having made your beds, you must lie about them . . . Bed-depth varies between four and five inches in trays, and between six and eight inches in shelves. The MRA has demonstrated that the number of mushrooms grown is independent of the depth of compost, but the weight of mushrooms is directly related to it, i.e., the deeper the bed the heavier the mushroom. It is almost the only evidence we have which helps to explain why mushrooms grown on trays are notoriously smaller (though recently it has been suggested that inadequate air movement is the primary factor responsible.

Beetles of the Staphylinid family have been observed to feed on mites and springtails, but no-one has suggested they be purposely introduced to mushroom houses for this purpose.

BHC. Benzene hexachloride, or Gammexane, is the nearest thing we have to a complete pest killer. It should be used with discretion, and alternated with other insecticides to discourage the evolution of resistant strains.

Blaniulus guttulatus is a pale-coloured red-spotted millipede which, though rarely seen in dark houses, sometimes attacks crops under glass, eating into the stalks at soil level. A nicotine spray is the suggested form of counter-attack.

Blood. The principal activator in the MRA formula for synthetic compost. Its price deters most growers from abandoning horse-manure.

Blowlamp. Playing the flame of a blowlamp (or flame gun) on shelving and uprights has been strongly advocated by Dr. Bewley for 20 years as a means of preventing the carry-over of pests and diseases in mushroom houses.

Books. More textbooks on mushroom growing should be written and fewer published. It is astonishing how they reveal to the authors the paucity of their knowledge. I admit it!

Borboridae. Of the swarms of small dark flies seen occasionally around composting manure some may be phorids, but many are likely to be members of the *Borboridae* family, who so far have not blotted their mushroom copybook. But flies of any sort are objectionable and potentially dangerous and should be discouraged.

Bordeaux Mixture. The old standby copper-sulphate fungicide which, surely, is no longer used on the modern mushroom farm?

Bracken. Towards the end of the war I saw some splendid composts prepared from bracken by Dr. M. C. Rayner at the Bedford College for Women, and thought how useful they might be as a base for synthetic mushroom compost. Unfortunately there isn't much bracken about here, and transport charges drove the idea from mind.

Brewers' Grains. A by-product of the brewing industry which provides a popular source of nitrogen in American formulae for synthetic composts.

Brown Plaster Mould. A fiendish mould which was once very common on outdoor beds and now, with our slowly-increasing knowledge, less common everywhere.

Brown Spot. The name used by our predecessors to conceal their ignorance as to whether the trouble was *Mycogone*, *Verticillium*, or of bacterial origin.

Bubble in Britain, Bubbles in the States, *Mycogone* everywhere—but not as often as it used to be. Zineb, in some formulations at any rate, has not proved as effective as we had hoped.

Bulletin. Short official statement of invalid's condition (Oxford Dictionary).

Buttons. Things to push or pull, depending on whether we think they are dead or know they are. Larger buttons are curiously popular in Covent Garden Market. Delectable in salads—but who eats them that way?

RESEARCH FUND, 1953

The 1953 Appeal for funds to maintain the Yaxley Research Station closed on 31st December, at £1,313 8s. 6d.

The Directors wish to acknowledge with thanks the following contributions, especially that from Mrs. Hauser:

Dr. E. Hauser (Switzerland) £20; B. Pratten £5; Captain Giles Tweedie £4 4s.; J. A. Guthrie £3 3s.; G. V. Allen £2 12s. 6d.; and E. C. Millais £2. Banker's Orders for November and December totalled £16.

FIRST STEPS IN GROWING

by McGregor Bulloch

2—CHOOSING WHERE TO GROW

Whether the intending mushroom-grower possesses a fortunate excess, a reasonable sufficiency, or a regrettable deficiency of the world's goods, efficient growing can be achieved *only* if the proposed farm is designed with one or two essential properties in mind. I cannot emphasize too strongly the necessity for careful thought, either when buying a second-hand mushroom farm, adapting existing unoccupied premises on one's own property or building a new farm from scratch. It would be interesting to know what growers believe to be the most important factor in successful mushroom cultivation. I think it would undoubtably be **insulation.** This may seem to be wandering away from the scope of this article, but some protection from the elements has to be the first consideration, and insulation is the prime factor governing the choice of buildings where mushrooms are to be grown.

If available assets allow it, make the insulating properties of walls and roofs as high as possible, even to an apparently ridiculous stage. If money is tight, build with the most efficient insulating materials possible, and allow for future addition to the insulation when the crops start to make money.

The most perfect insulation available is in the use of underground mines or caves, where nothing protrudes above ground and there is preferably a covering of several feet of earth or concrete over the top. Because of the infinite thickness of the walls, a negligible variation in temperature is experienced, as little as two or three degrees Fahr. from winter to summer in the best caves. If the mean temperature is anywhere from 55° to 60° F. heating bills are eliminated at once. Since one rarely gets something for nothing, other troubles are experienced in caves which may not affect the grower with an above-ground layout, chiefly ventilation, of which more anon.

A compromise between normal mushroom houses and caves may be obtained by digging wide ditches and covering at ground level with curved roofing material of corrugated iron or concrete, the whole covered with earth and turf. Unless one is lucky enough to find ready-made ditches and a perfectly drained site, there may be a lot of trouble in store. The method cannot be ruled out entirely if the ground favours excavation by a large mechanical digger, but should only be contemplated if good drainage is possible and there is no risk of serious flooding.

Assuming then that growing is to be done above ground, there are still a number of problems to be faced. Shortage of money may rule out the erection of new buildings, in which case premises which have

been used for other purposes have to be considered. The variations here can be unlimited, among them being uninsulated wooden or corrugated-iron buildings, barns, greenhouses, stables, disused brick-works and factories, old manor-houses, mills, rhubarb-sheds and so on. The expense of conversion, chiefly insulation, must be allowed for, but this is often unnecessary where the walls are of thick stone as is the case with many old buildings.

Don't guess at the result! Ask a competent heating engineer—*not* a local ironmonger—what your heating bills are likely to be. All he will want to know will be what sort of temperatures you wish to maintain and, of course, how much continuous ventilation you propose to give the rooms. He will advise you on the amount of extra insulation which may be necessary, or if the walls are thick enough, the amount of heating which will have to be provided. The figures you should give him are as follows. The steady temperature to be maintained during cropping can be anywhere between 55° and 60° Fahr. The generally agreed mean is 58° F., although I have a personal preference for 61° to 62° F. 58° is safer however, and that is the figure you should give. At the same time, the heating expert should be told that this temperature is required in conjunction with a scheme of ventilation which will allow for *at least* a complete change of air in the building per hour continuously. There is still a lot to be learned about the ventilation requirements of mushrooms, and most growers would prefer more ventilation than this, but in really cold weather a line has to be drawn somewhere. The main thing is to prevent the novice from getting a completely stagnant atmosphere, which can be fatal, and it would be as well to stress here that ventilation may well be as important as insulation, despite what I have said in the first paragraph of this article.

Before leaving the heating expert, we arrive at a decision which has to be made, and which will affect part of his calculations, namely, should one grow in shelves or in trays?

There must now be explained in brief a process which will be enlarged upon later. This is known as peak-heating, and as its name implies, consists of raising the temperature of the prepared compost to a certain peak temperature and holding it for a period in order to complete the curing of the compost, kill off insects and eliminate as many competitive fungi as possible before spawning takes place.

When growing on shelves, peak-heating must be carried out in the growing-sheds, and the heating installation in these sheds will have to be designed to supply and maintain, in conjunction with the insulating properties of the walls and roofs, a steady temperature of 140° F. for a period of up to 72 hours continuously at peak-heat.

On the other hand, if tray-growing is decided upon, the growing sheds do not normally require a temperature higher than 60° F., and if money is short, the minimum size of heating installation can be budgeted for, whether steam, hot water or electricity. This refers only to the part of the installation in the growing sheds themselves, since heat will be required in the separate peak-heating room which is used in tray-growing.

The French consider

COSTS AND SELLING PRICES

A question of current interest here was also discussed at a recent meeting of French mushroom growers—production costs and selling price. The obvious starting point there, as here, is the simple economic fact that present profits can only be sustained by maintaining the present margin of profit per pound, or by increasing production in inverse proportion to any fall in this profit margin. As the selling price is falling, the profit margin can only be maintained by an equal reduction in cost of production.

The French take the realistic view that they must provide for a fall in selling price, that they should take advantage of this to increase sales, which should be possible at the lower prices, and at the same time they must do what they can to reduce production costs.

The establishment of their Research Station at St. Cyr is a step in this direction, but cannot be expected to produce quick results. The most likely source of immediate benefits is mechanisation, for example the use of turning machines: one grower was reported as using a machine which takes manure from a heap, shakes it and restacks it at the rate of 10 tons an hour with three men. It is said to be expensive and suitable only for a large farm.

There is much interest in the Tray System, which is being adopted by some cave growers and is said to increase their yield per ton of manure to at least double that obtained from their traditional ridge beds, at little extra cost apart from the initial capital outlay. It was reported that a film illustrating the Tray System would soon be available.

It was suggested that the actual result of adopting the Tray System would not and should not be a rapid doubling of mushroom production in France. This could only upset the balance between supply and demand, to the disadvantage of the growers. The greater efficiency of the Tray System should be used to secure the same output of mushrooms from half the quantity of manure, and so reduce production costs. Also, reduced demand for manure should lower its price. Any increase in total production should come gradually, so that it could be absorbed by increasing demand.

French growers were warned that neither the British nor the American synthetic composts were suitable for immediate use on a commercial scale, as both use materials which are not readily available in the same form in France, and which are outside the normal experience of French growers. They should be prepared for a period of trial and adjustment before these composts could be used commercially.

It was announced that an experimental station is to be set up in the Gironde to help growers in that region to make use of the results of research.

R.L.E.

MY WAY OF GROWING

14—Clifford King, *of Horsell Common, Woking*

Managing Director, Heather Farm Ltd.

My early experience with regard to horticulture was confined to Dutch light market gardening and salad growing; I had some 4,000 frames under cultivation in 1943 growing forced lettuce, carrots, cucumbers and melons.

Towards the end of that year my mind turned to mushroom growing and I naturally had to give great consideration to that very important commodity—horse manure—and to buy a property which was near enough to the main producing areas, that is to say Epsom, London, and the nearby Oxford hunting country.

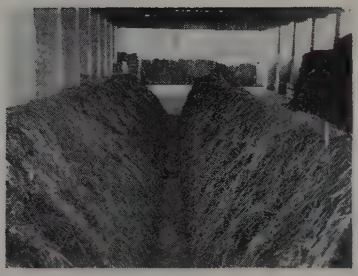
In early 1944, I laid my first shelf beds which were composted exclusively with racing manure with the addition of Adco M at the rate of 1 cwt. to 4 tons of manure. These crops were grown in the original sheds which were on the farm at the time of purchase and to all intents and purposes were not proper mushroom buildings. The results were at that time very encouraging as I was getting some 8/- to 10/- per pound for my mushrooms and this automatically subsidised my very inefficient growing.

As time went on I had to consider more sheds and, with my very limited information and resources, I erected some sheds in 4″ breeze 60 ft. × 25 ft. which have since lost favour to the much more suitable Watford Handcraft Hut, owing to their ease of construction and complete immunity to heavy wear and tear during pasteurisation.

I was not experiencing any undue diseases owing to the fact that the farm was new and there was no site contamination but, as the farm developed, I began to run into the usual troubles. One of these was eelworm, which gave me many headaches. I am pleased to say that this was eliminated by thorough hygiene, including boiling all the bedboards for ten minutes in strong cresylic acid solution between each cropping.

In my continuous search for more efficient ways of growing, I next decided to turn the farm over to cultivation in trays—a system which lends itself to mechanisation and facilitates greater cleanliness.

I have just re-organised the farm and, at the date of writing this article, I have completely gone over to the Tray System. My cropping since we cleared up the attack of eelworm has averaged a shade over $1\frac{1}{4}$ lb. per sq. ft. and the diseases to which I have been subject have fortunately been very few, except that in the past eighteen months I have been experiencing a heavy attack of Flour Mould in most sheds.



I used to give my manure four turns and then load two days after the last turn, but I came to the conclusion that I was under-composting, so I gave five turns in an endeavour to clear up this mould. This was not entirely successful, although a limited improvement took place. It was only some six months ago that I learned that more air between the trays when pasteurising would help to eliminate the trouble. I now give the manure five turns at approximately six-day intervals, stack the trays with a 2″ air space between, and pasteurise for 24 hours. Although it is early to prophesy, I believe I have cured this trouble, but I am of the opinion that all growers experience localised outbreaks of Flour Mould from time to time.

I am cropping four times per year in strict rota and each shed bears for $8\frac{1}{2}$ weeks.

The manure which I am using now is exclusively of the medium-heavy to heavy type, and in my experience it requires much more careful composting than the racing-stable manure with Adco M added.

Here, as a moderately large grower with my own manure contracts to supply the farm, I find it best to keep a large amount in excess of my requirements as I feel that to have the manure completely fresh from the stables is most essential. My surplus is disposed of to other mushroom farms or whomsoever might be requiring manure at the time it is available. It is here that my experience in both contracting and growing might be of interest to other growers and I would like to quote some figures regarding tonnage of medium-heavy manure required :—

6 tons to the 1,000 sq. ft. of trays to a depth of 5 inches.

11 tons to the 1,000 sq. ft. of shelf beds to a depth of 9 inches.

(Tonnage slightly less than these amounts may be used in summer months.)

I strongly object to the system of buying or selling manure by the yard, although I have been advised that it is not illegal. For the information of those growers who prefer to use racing-stable manure with the addition of Adco M, I suggest that they contact their dealer and get him to quote them by the ton. This naturally will cost them more per ton than the medium-heavy, because the manure is lighter and therefore transport costs are higher, but the financial benefit that they will derive when filling will more than offset the increased cost.

In the past year I have purchased considerable quantities of gravity roller conveyors and these again have cut down my costs and avoided the unnecessary bottlenecks which took place before.

With regard to general fly control, I use Black Arrow and Agrocide smoke bombs alternately, but recently I have experienced, in common with other growers, a severe attack of flies and I have been

advised to use Black Arrow No. 4 or Gammexane, which have given me a 75% control. I am continuing this treatment until I can see no further life in the sheds.

I have gone over entirely to peat for casing and, in the short time during which I have used it, I have found that cropping commences some five to six days earlier than with soil and it is a much better casing medium throughout, both in its easier preparation and the fact that women can handle it much better than soil. (I use 20 lb. Carbo-Lime to 1 cwt. of Peat).

All picking is done by female labour except on Sundays when it is inevitable that men must come in to cope with the two days' crop. All mushrooms are railed to Commission Agents in the usual manner, with the majority going to Covent Garden. Here again I would mention that I strongly deprecate sending to more than one Commission Agent in the same market as it tends to weaken the salesman's prestige when dealing with buyers.

In conclusion it only remains for me to mention that I have been growing for the past nine years and, providing the trade does not weaken any more than it has, I shall be reasonably satisfied. I shall continue to explore the possibilities of even greater mechanisation and this, coupled with the much discussed publicity scheme, will tend to encourage me in this very intricate and worrying subject known as mushroom growing.

"LONG" BEDS AND SHORT CROPS

Dr. R. L. EDWARDS replies to Mr. GALBRAITH

Mr. Galbraith has evidently thought more deeply than many growers do about the economics of the business, but there are some points in his article (MGA Bull. 49, January, 1954) on which I do not agree, and I am afraid the general impression given by the last column of his Table 1 is liable to be very misleading. It appears to show that, at a given fraction of full potential, shallow beds are more profitable than deep (9″) ones.

To take the minor points of difference first:

1. " Cost of spawn should be related to weight or volume of manure, not area." This implies that 1 carton of spawn does for, say 40 sq. ft. of 9″ bed, or 80 sq. ft. of 4½″ bed. Does Mr. Galbraith really use only half as much spawn per 1,000 sq. ft. in beds of half depth? I think he is unique if he does. He might be right to do so, but it is going too far to assert as he does, that we are incorrect in relating the cost of spawn to area spawned. Most growers use approximately the same amount for the same area of beds, deep or shallow, and that in fact is how their spawn should be charged—on an area basis.

2. Similarly the cost of chemicals used in sterilising houses, insecticides and fungicides applied during cropping, are likely to be the same for a house with 1,000 sq. ft. of 9″ beds as for 4½″ beds, and should be related to area rather than weight of manure.

3. Mr. Galbraith himself says that thin beds need more heat, so the cost of fuel for peak-heating 960 sq. ft. of 4½″ beds (5 tons of manure) would be more than for 960 sq. ft. of 9″ beds (10 tons), and this would be true regardless of the crop picked. Fuel therefore should be charged per house per crop, and not treated as a flat charge per lb. of mushrooms. Annual overhead charges are the same whether a house produces 4,000 lb. of mushrooms or 8,000 lb., so the charge per lb. would be half as much in the latter case, and the flat deduction of 1/3d. per lb. used by Mr. Galbraith operates against the entries in his table giving high total outputs per year (not necessarily per ton of manure).

Picking, packing, labour and materials, bed cleaning and transport are the items properly chargeable per lb. of mushrooms.

And so we come to the last column of the Table.

Presumably this is intended to compare the comparative profits actually obtained by the grower by using the various depths and cycles tabulated, although Mr. Galbraith does not explicitly say so. In any case if that is not the object this column seems rather pointless.

But this last column is only of practical importance if the grower's output and profit are determined and limited by the tonnage of manure available.

In fact the limiting factor on farms in this country generally is not tonnage of manure, but growing space.

Now Mr. Galbraith's Table shows for example that at 4/5 potential, 9″ beds cropped 3 times a year give a profit per ton per crop per annum of £23 8s. 9d., whereas 4½″ beds, everything else being the same, give a profit of £32 8s. 0d.

But the grower using 9″ beds would put through in the year twice as much manure per house, so that where the shallow-bed grower made £32 8s. 0d. on 1 ton of manure, deep beds would give £46 17s. 6d. profit on 2 tons.

Whatever growing space is available, and however much it is increased, this remains true.

The grower's success is measured by his profit on the year's working and there is no real substitute for this figure. This is the figure he must work to improve. All the figures for yields, costs, and selling price affect the total profit, but no one of them alone is a complete substitute for it.

As the grower's potential in a given year is limited by his growing area, profit per sq. ft. per year is an equivalent index of efficiency.

Within the limits of normal methods of growing, the best simple guide is output per square foot per year, although of course if two growers have the same annual output per sq. ft., the one with lower costs (per lb. or per sq. ft.—they are equally valid in this case) is better off.

As growers are quite naturally reluctant to disclose their annual profits (or losses), and their exact costs of production, their desire to compare results can most logically be fulfilled in terms of annual output per sq. ft.

B. D. MORETON, *Advisory Entomologist, discusses*

THE PHORID

"NO REAL EVIDENCE OF ACQUIRED RESISTANCE"

This year's disastrous attacks by Phorid flies may lead us to wonder whether we have not been deluding ourselves on the subject of mushroom pest control measures. Have the insecticide defences only appeared successful because they have not before been severely tested?

Attacks have been on the biggest scale in the Worthing area, where it seems that the majority of growers have suffered and many houses have more than once been emptied out with practically nothing picked. But they have also occurred on a small number of nurseries elsewhere in Sussex, and in Kent and Surrey, though so far only two cases have been recorded outside the south-eastern counties, in Norfolk and Lancashire. Affected areas are not all coastal, and no direct connection is known between the Phorid infestations and the seaweed which is inhabited by quite different flies, notably the shore fly *Coelopa* and various small black Borborids.

The precise identity of the Phorids is as yet unsettled. All the flies which we have sent to Mr. C. N. Colyer, an authority on this group, have been provisionally named *Megaselia* (*Megaselia*) *plurispinosa* (Lundbeck), but he says that this may prove to be a variety of a Phorid known as *M.* (*M.*) *halterata* (Wood). These two have hitherto been regarded as distinct species, but some of the flies from mushroom beds appear to show characteristics intermediate between the two. Both forms have been known for many years in Britain, and *halterata* has already been recorded from cultivated fungi on the Continent; doubtless *plurispinosa* (or *halterata*) has frequently occurred in small numbers in British mushroom beds in previous seasons.

Why they have been so abundant this year is unknown. The Phorid family is very large and includes many species living in fungi and decaying organic matter; possibly a damp summer has made available a bigger quantity than usual of suitable breeding sites for they seem to have been abnormally numerous about parts of the countryside. It is curious that other species have not also been above normal in mushroom beds.

It has been suggested that the infestations may be associated with the use of spent mushroom compost, particularly under glass, and it would be interesting to know whether the experience of growers, especially those in areas less congested with mushroom holdings than the Worthing area, support this idea.

The flies were first noticed in May or June, and from July onwards became an increasing nuisance in themselves because of their numbers, apart from damage caused by their larvae, and exceptionally mild weather extended their activities into the winter months. Some of the heaviest crop losses occurred in the period September-November.

Little is known about the biology of *plurispinosa*, except that its larvae live principally in the compost and have not so far been found tunnelling in the mushrooms, in contrast with the already familiar *Megaselia* (*Aphiochaeta*) *nigra* (Mg.). The duration of the cycle egg—larva—pupa—adult probably occupies four to six weeks. The pale coloured forms unable to fly which growers have noticed running over the beds are flies newly emerged from the pupal stage; several hours have to pass before they are fully hardened and their wings are ready for flight.

The flies appear to be attracted by the smell of mycelium for they have been observed to collect round newly opened spawn cartons, and they will lay eggs in the mycelium immediately it begins to run.

The early nature of the attack as well as the abundance of the flies accounts for the severity of the damage, for growth of mycelium has been greatly reduced and sometimes almost entirely prevented. Damage has sometimes seemed out of proportion to the number of larvae present, and it may be that their excretions are inimical to growth so that one larva can affect quite a wide area of bed. The ability of grain spawn to make better growth than ordinary manure spawn in the face of attack has several times been noted.

It has frequently been stated that the flies are resistant to DDT and BHC, but there is no real evidence that they have acquired resistance through the routine use of these insecticides and that this is the reason why they have proved so difficult to control and have become so numerous. BHC and DDT, except in very high concentrations, are known to be slow acting, and failure to obtain control with these insecticides used in the common ways may largely be due to sheer weight of numbers, for it is asking much even of modern insecticides to prevent a proportion of such populations from getting as far as egg-laying before death. One of the infested holdings in Kent is in fact one where DDT and BHC are very little used and is well isolated from other mushroom growers.

Laboratory experiments and observations in mushroom houses indicate that BHC and DDT can effect a complete kill given sufficient time. Batches of flies were introduced into bolting silk sleeves which had been dipped in various insecticides and dried. Gamma-BHC at the normal concentration of 0·01% caused 100% mortality in 3 hours in one case, but not until at least 5 hours in another trial, and in both 75% were still alive after 2 hours. With DDT emulsion at 0·1% DDT, 50% were still alive after 4 hours and a few were alive after 8 hours, a considerably longer exposure being necessary to bring about 100% kill. Toxaphene at 0·1% resulted in an insignificant number of deaths after 8 hours. 0·015% dieldrin needed some 7 hours to bring about a complete kill, about 4 hours to effect about 75% kill, and produced no deaths in the first two hours. Malathion at 0·1%, as emulsion, however, gave 100% kill in 2 hours, and in 5 hours when the deposits were a week old. The BHC deposits after a week had much reduced effects.

These figures illustrate the slow action of BHC and DDT and help to explain why even almost daily treatment of beds with 5% BHC dust has failed to give sufficient control, especially when dusting began some days after spawning, e.g. just before casing, which is common practice. There is nothing surprising in this, and the somewhat parallel case of cabbage root fly may be quoted, where BHC placed round the roots of cabbage will not kill the flies quickly enough to prevent egg-laying though it will kill the young larvae subsequently forming.

A more promising measure is to make the compost toxic to the young larvae, and growers who have secured most control are those who have mixed 5% BHC dust with the compost while filling trays or beds. At least 6 lb. of this dust per ton of compost seems to be desirable, and even higher rates, e.g. 10 lb., might be better to allow for some loss during peak-heating and to give longer persistence. Shanahan reported in the *MGA Bulletin* 17 of October, 1949, Australian experiments in which rates as high as the equivalent of 16 lb. of 5% dust per ton produced no adverse effects on the crop. Even mixing is of course important, and although no cases of BHC contamination have been confirmed in Britain, care is obviously necessary when experimenting with high rates. The spent compost might be liable to cause tainting of some vegetable crops if later used as a soil dressing.

The duration of persistence of BHC in the compost is unknown, but even if its effects do not last the life of the bed and it only protects against Phorids for the first week or two when spawn is running this is a valuable achievement especially if combined with a clean start after efficient peak-heating. Control during the growing period is vital, and subsequent egg laying by flies is likely to be much less dangerous. Once the compost has become freely colonised by larvae no insecticide treatment known will undo the damage.

Measures to be adopted after spawning are difficult to suggest, and the sight of flies running actively over beds white with 5% BHC dust (in one case $\frac{1}{2}$ lb. per 1,000 sq. ft. had been applied daily for about 3 weeks) has not been encouraging. Several growers have said that nothing less than 20% DDT wettable powder as a dust at about 2 lb. per 1,000 sq. ft., is adequate. This and 5% BHC dust at a similar rate, each once a week, were used with apparent success by one grower.

It must be remembered that in America the use of DDT (and for that matter BHC) actually on the beds are not officially recommended owing to the fear of contaminating mushrooms, especially with DDT. Applications of 20% DDT should perhaps be restricted to periods between flushes until more is known about the possibility of absorption of these insecticides.

Smokes of BHC, DDT and parathion have not seemed successful in heavily infested houses, though the apparent failure to destroy all the flies may have been because of fresh emergences after the smoke had cleared. It is doubtful if smokes leave a persistent deposit of great value. Nicotine fumigation is more effective but may cause spotting of the mushrooms. Sulpho-TEPP aerosol does not seem to have met with

great success. Pyrethrum atomised or as dust should give a good knock down, but all three of these insecticides as well as being expensive would only have short lived effects.

Malathion, an organo-phosphorus insecticide shown by American workers to be about as safe as DDT to handle and used at similar concentrations, is worth further trial, both mixed with compost and as a spray or aerosol. It may be especially useful if resistance to the chlorinated hydrocarbons like DDT, BHC, aldrin and dieldrin has actually developed or does so in the future (such resistance has so far been confirmed with very few insects, notably the house fly and fruit flies). Whether it is absorbed by mushrooms or affects their growth is as yet unknown.

The exceptional measures used to counter the Phorid plague should not be adopted as a routine unless such abnormal infestations continue or are repeated. It is not impossible that other pests might at some time become abnormally abundant and that insecticide treatments ordinarily sufficient would be found inadequate.

It would pay to devote further study to methods of rendering compost toxic to pests, and perhaps also following a different line on methods of deterring flies from entering mushroom houses. Deodorants and counter-perfumes like those in common domestic use might destroy or mask the smell of the compost or the growing crop and conceivably render the houses unattractive.

An interesting phenomenon which has occurred along with Phorid infestations several times has been the appearance of saprophytic **Rhabditis** *eelworms in such countless numbers that the surface of the casing has glistened with them. They twine round one another in little white pillars projecting from lumps of soil or peat, apparently with the object of attaching themselves to passing insects for transport to fresh sites. They may have been introduced by flies, and attempts to get them to damage mushroom mycelium have failed.*

MAC'S MUSHROOM FAMILY

2. Senorita Carmen Psalliota

FRED. ATKINS *meets*

LA FRANCE DISEASE

The sight a few days ago of thousands of trays completely devastated at their third flush by a disease which was new to me was something I shall never forget. The trouble had been diagnosed as La France Disease, and on returning home I looked up Sinden and Hauser's paper in *Mushroom Science I:*

Affected mushrooms, they said, had very thin long stipes and globular thin-fleshed caps somewhat resembling Ink Caps. "They died in a rather soft rot turning slightly brown, but not dark. No foul odour was noticeable, but the mushrooms did not have the corky texture associated with the Mummy Disease. Dead specimens kept for two days became slimy with bacteria and rapidly decomposed, although those which were still living when picked were not in decomposition . . . . . Examination of the compost, the dying mycelium and the affected mushrooms did not reveal the presence of any definite foreign organism . . . . . At the third break, the whole house succumbed."

The authors state that La France Disease has been mistaken for Mummy Disease but is **unquestionably distinct.** I thought it worthwhile to refer back to Tucker & Routien's 1942 paper. There it is stated:

"The first evidence of the development of the Mummy Disease is the appearance, in a circumscribed area, of a few sporophores with stipes longer and smaller in diameter than normal, and often slightly curved; the pilei fail to attain normal diameter and are often in a tilted, rakish position, instead of at a right angle to the stipe . . . . . The stipe elongates abnormally, resulting in early rupture of the veil and premature flattening of the pileus. The entire sporophore of the white varieties is slightly grey and dry in appearance . . . . . When the next break appears, the stipes are long, slender, and often markedly curved. The pilei are small, sometimes barely one half inch in diameter, and usually in a tilted position on the stipe. The gills and annulus are often poorly developed . . . . . Finally, (the mushrooms) become spongy, dry and tough."

What about *Fusarium*, I wondered:

After the first flush, according to Wood, the crop rapidly degenerates into small, withered, brown and undeveloped mushrooms. A big proportion of the mushrooms are found to have brown caps with a matt surface, to be dry and pithy inside the stalk, of a rubbery texture and, generally, the interior of the stalk is quite brown.

We really ought to look more closely into these "abnormality diseases."

YOU'LL WANT THIS!

MUSHROOM SCIENCE—2, the Proceedings of the Second International Conference on the Scientific Aspects of Mushroom Growing, which took place in Belgium in June, 1953, and which was attended by mushroom scientists and growers from all parts of the World, is now available from the MGA Office at Yaxley at a cost of 12/- per copy, post free.

Like *Mushroom Science*—1, this new publication is invaluable to growers large and small and is well worthy of a place on the desk of everyone interested in mushroom cultivation.

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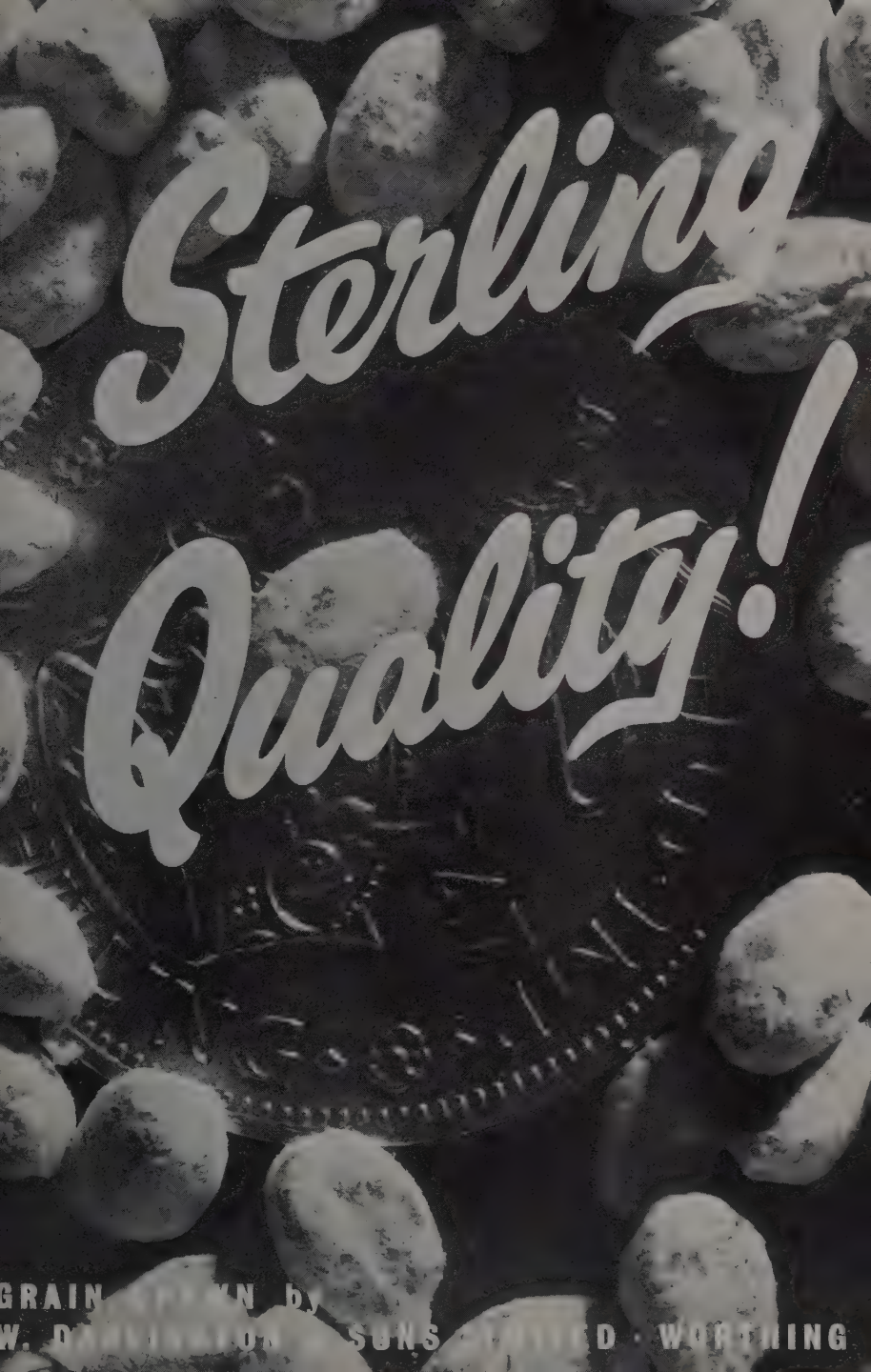
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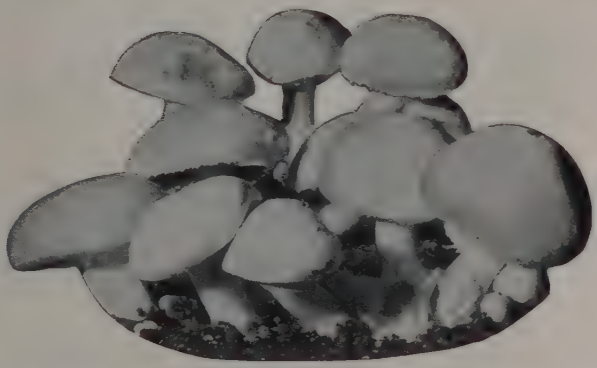

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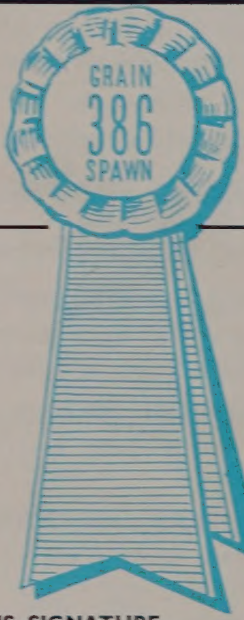

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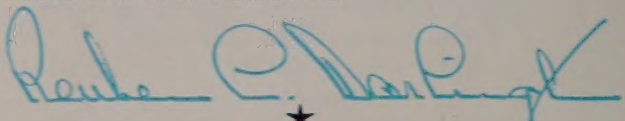

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